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HELOPELTIS.

"What we know and what we want to know about it."

HELOPELTIS ANTONII, the so-called "Mosquito Blight,"* was described by Dr. Signoret (a French Entomologist) from Ceylon more than forty years ago in 1858. The description published in the Annals of the Entomological Society of France† makes no mention of the plant upon which the insect subsisted in those days, before the introduction of cinchona or tea. Cacao—according to Trimen—had been established in Ceylon for some time previous to that date, and it is possible that there was a sufficient number of trees to afford food for the *Helopeltis*.

* The popular name of "Mosquito Blight" is an unfortunate one, and has led many planters—by a false analogy—to suppose that the *Helopeltis* may breed in swampy ravines and stagnant pools. The very slight resemblance to a mosquito is purely superficial. The two insects belong to widely separate Orders, and undergo a very different development in their early stages.

† VI., p. 502, t. 12, II. f. 2 (1858).

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The recorded food plants of the insect in Ceylon are cacao (*Theobroma cacao*), the several species and hybrids of tea, cinchona, and annatto (*Bixa Orellana*). Besides these economic plants, I have observed *Helopeltis* feeding and breeding upon the "wax apple" (*Eugenia aquea*).

The earliest notice of the appearance of *Helopeltis* on cacao in Ceylon was in 1880 or 1881 in the Matale District. In 1884 Dr. Trimen exhibited specimens and read a short note upon their occurrence at a meeting of the Linnæan Society in London. It is remarkable that it was the damage done to the young leaves and twigs that then attracted the attention of cacao planters. At the present time it is the pods of the plant that suffer most from the attacks of the insect.

With respect to cinchona, I observed it myself puncturing the young leaves of *Cinchona ledgeriana* and *officinalis* in 1886 in the Pundalu-oya district, at an elevation of over 3,000 feet. An allied insect (*H. bradyi*), was reported to be injuring cinchona in Java in 1882.

I have found it difficult to obtain accurate information about the appearance of the pest in the various tea districts. My first personal acquaintance with it was from specimens sent to me from the Morowak korale district in 1889. But the earliest record is from the Kelani Valley, where it is said to have first appeared on an estate in Yatiyantota in 1883, though it did not become plentiful until 1892, when it was reported from several other estates. In 1893 the matter was brought up at a meeting of the Kelani Valley Planters' Association, when concerted action was suggested, so it is probable that the pest was then causing considerable injury to the tea. In 1890 my attention was drawn to serious damage by the insect to tea in the Kalutara district. The pest was first noticed in Udagama in 1898. I have this year (1901) observed a few cases of attack in the Balangoda district. I am told that it has been noticed there for a year or more, but has not as yet caused any appreciable injury; but it would be rash to suppose that the pest will not increase if no attempts are made to check it.

Life History.—Though we have a knowledge of the different stages of the insect, from the egg to the adult, the full life-history is not accurately known. The eggs are laid either singly or in groups of from two to five, in the rind of the pod (in the case of cacao), and in the young stalks (in the case of tea). In the latter they are almost invariably deposited at some point above the "initial" or "fish" leaf. They are embedded in the tissues of the plant, the only external indication being the presence of a pair of silvery hair-like horns projecting from the extremity of each egg. In ten days' time the egg hatches out into a small reddish insect, with longish legs and antennæ, looking not unlike one of the slender ants that frequent the tea blossoms. This insect grows rapidly in size, without greatly altering in form, until it is nearing the final change, when small rudimentary wings may be observed sprouting from the sides of the body. In the course of its growth it changes its skin some three or more times (the exact number has not yet been determined), and, after the last change, appears in the red, black, and white garb of the adult *Helopeltis*. In all its stages the insect may be readily recognized by the so-called "drum-stick," or erect-knobbed horn projecting from the middle of the back (technically, from the part called the scutellum). We do not yet know how many moults occur during the growth of the insect, the duration of these immature stages, or the length of life of the adult insect. The young insects do not thrive in captivity, and I have never been able to rear one up from the egg to the adult.

Nothing is known of the natural enemies of the *Helopeltis*, if it has any. Should any insect or other animal be noticed attacking the *Helopeltis*, I should be greatly obliged if the observer would send me particulars of the fact, and, if possible, specimens of the assailant.

Habits.—The *Helopeltis* insect feeds—in all its stages—upon the sap of the young leaves and shoots (or, in the case of cacao, upon the fruit). The symptoms are almost too well

known to require description. Each puncture of the insect is followed by a dark brown or black spot, the tissues of the leaf being actually killed at that spot, partly by the exhaustion of the contents of the cells, and partly (probably) by the injection of some irritating fluid, though this has not been actually demonstrated. When the punctures are close together the spots coalesce, and the whole leaf shrivels and dries up. When a young bud is punctured, that bud dies back. When the insects are very numerous, every single bud may be killed back in this way, resulting in a complete cessation of flush.

The insects feed at night and during the early hours of the morning. After 9 A.M. it is often difficult to find a specimen at work. It is still somewhat of a mystery where they conceal themselves. It was thought at one time that the adult insects flew away to the jungle during the heat of the day, or retired into neighbouring shade trees. But this has never been proved, and is extremely doubtful. It is certain that the immature insects cannot remove themselves in this manner, and it has been observed that when disturbed these young insects run down the stems into the heart of the bush. It is most remarkable how, even in fields where they must be swarming, the *Helopeltis* insects secrete themselves during the heat of the day. I have frequently tried to shake or beat them out of the tea bushes, but it is quite exceptional to secure a specimen in this way. A minute examination of the centre of the bush produces no better results, though it is almost certain that they are somewhere there. It was thought possible that the insects might go into hiding under stones and loose earth below the bush. To test this theory, a broad band of sticky substance (jak juice was used) was applied to the stems of a certain number of trees at midday. All punctured leaves were plucked from these marked trees, but fresh punctures—evidently made by immature insects—appeared during the following night, proving that they had been resting somewhere above the sticky zone. Bunches of dry grass were placed in the centre of some bushes to see if

the insects would hide in them, but on pulling these to pieces later they were found to be untenanted.

The comparative immunity from attack of certain species or varieties of tea is most marked. Pure Assam indigenous is practically untouched. Of the hybrids, the more the plant partakes of the Indian strain, the greater is its immunity ; the nearer the China strain, the more is it open to attack. This fact was most conspicuous on an estate visited by me in Kalutara. Two adjoining blocks, without any intervening boundary, were planted, the one with Assam indigenous plants, the other with a low jât hybrid. It was possible to walk up between the two adjoining rows and see the tea on one side quite healthy, while every bush, on the other hand, was badly blighted. In another field of "indigenous" plants supplies of an inferior hybrid had been put in. These supplies could be at once detected from a distance by their unhealthy blighted appearance.

It is difficult to obtain careful records of attack—noted month by month—extending over several years. But I have one such record from an estate in the Kelani Valley, which gives the numbers of *Helopeltis* insects collected month by month during the last seven years, together with the monthly rainfall throughout that period. From these figures it appears that the worst attack takes place in July and August. After September there is a rapid drop, reaching its lowest level in November, followed by a tendency to gradual (fluctuating) increase up till February or March, when there is another rapid fall. In April and May the pest practically disappears. The recrudescence commences towards the end of June and reaches its height in July or August. There thus appear to be two periods of increase and decrease during the year, a major and a minor period. The major period is represented by the zero point in April and May, followed by the maximum in July and August. The minor period consists of the fall in September, October, and November, followed by the increase up to March. The March attack never approaches the gigantic proportions of the July–August attack, the figures being approximately as 4 to 9.

The results obtainable from a study of the rainfall are rather conflicting. December, January, February, and March, during which time the pest is on the increase, are comparatively dry months and register the lowest rainfall. April, May, and June are very wet, and there is then scarcely any attack. Studying this period alone, one would be led to the supposition that dry weather favoured the pest, while rain deterred it. But if we examine the second period, we find that July, August, and September are distinctly wet months, and it is during these very months that the pest attains its maximum development. We find, therefore, that the two periods of increase, viz., December to March and June to August, are marked by dry weather in the first case and wet weather in the second. Similarly, the first period of inactivity (in April and May) occurs during heavy rains, and the second period (October and November) during comparatively dry weather. It is noticeable that both the maximum and minimum of attack occur during the wettest months.

It should be observed that these deductions are made from records from a single estate in one district. To be of real value they should result from the comparison of a number of records from many estates in different districts. I would appeal to all those interested in the subject for such particulars as will enable me to formulate more accurate deductions. There are doubtless many records of captures now available. I know that it is the custom to count the number of insects brought in each day, and the figures are entered in the estate books. Even a statement of the number of coolies employed in the work, day by day, will be of considerable value in estimating the rise and fall of the attack.

But the chief problem requiring solution is, "What becomes of the insect during the period or periods when it disappears from the tea?" Does it subsist upon some other plant? Does it lie dormant in some hole or crevice? Or does the insect, towards the end of its period of activity, deposit specialized eggs that remain unhatched for a much longer period than is ordinarily the case?

These questions are of the greatest importance, and can only be answered by very careful and long-continued observation on the spot. I hope to undertake this investigation very shortly by repeated visits to an affected estate at the critical periods.

Until these points have been satisfactorily elucidated I can suggest no other remedial measures than those which are now being carried out on most affected estates, viz., (1) the careful collection and destruction of the insects; (2) plucking to the initial leaf, in badly attacked fields, to ensure the destruction of the eggs.

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